BUDDHA INSTITUTE OF TECHNOLOGY
Gida Gorakhpur

Department- Computer Science and Allied
(ARTIFICIAL INTELLIGENCE MACHINE LEARNING)

Program & Semester- B.Tech 3rd Year (6th Semester)

Course and Code- Social Media Analytics and Data Analytics BCAM 061

Course Outcome

CO No.	Course Outcome	Bloom's Knowledge Level (KL)
CO 1	Understand basic concepts and need of social media analysis	
CO 2	Understand the fundamental of graphs and matrices in social media analysis	
CO 3	Understand networking fundamentals of social media analysis	
CO 4	Understand social networking and modelling concepts and methods.	
CO 5	Understand processing and visualizing social media data	

UNIT-1
Introduction to Social Media

Q1. Explain the evolution of social media from Web 1.0 to Web 3.0 and analyze its impact on communication and data analytics.

(AKTU End Semester Exam 2022, Similar concept in GATE IT – Internet Evolution)

Introduction

The evolution of social media is a result of continuous advancements in web technologies. It has transformed the way individuals communicate, share information, and generate data. This transformation is generally categorized into three phases: Web 1.0, Web 2.0, and Web 3.0. Each phase represents a significant shift in interaction, content creation, and analytical capabilities.

Web 1.0: Read-Only Web (1990–2004)

Web 1.0 is the earliest stage of the internet characterized by static content and limited user interaction.

- Users were only consumers of information and could not create or modify content
- Websites were built using basic HTML and lacked dynamic features
- Communication was one-way, similar to traditional media such as newspapers
- Examples include early websites like Yahoo directories and static company pages
- No concept of social networking or user-generated content

Impact on Communication

Communication was passive and lacked engagement. Users could only read information without interacting with others.

Impact on Analytics

Data generation was minimal. Analytics was limited to basic metrics such as page views and visitor counts.

Web 2.0: Read-Write Web (2004–Present)

Web 2.0 introduced interactivity, collaboration, and user-generated content, leading to the rise of social media platforms.

- Users became both consumers and producers of content
- Platforms like Facebook, Twitter, YouTube, and Instagram emerged
- Features such as likes, shares, comments, and tagging enhanced interaction
- Real-time communication became possible
- Development of APIs enabled integration across platforms

Impact on Communication

Communication became bidirectional and highly interactive. Users could share opinions, participate in discussions, and form online communities.

Impact on Analytics

- Massive data generation due to user activity

- Emergence of Social Media Analytics (SMA)
- Techniques such as sentiment analysis, trend detection, and user behavior analysis became important
- Businesses started using analytics for targeted advertising and customer engagement

Web 3.0: Read-Write-Execute Web (Present–Future)

Web 3.0 is known as the intelligent or semantic web where machines can understand and process data meaningfully.

- Use of Artificial Intelligence and Machine Learning
- Data is structured and linked, enabling better interpretation
- Decentralization through blockchain technology
- Personalized and context-aware services
- Voice assistants and smart applications are key examples

Impact on Communication

Communication is becoming more personalized and intelligent. Systems can predict user needs and provide customized content automatically.

Impact on Analytics

- Advanced analytics using AI and deep learning
- Predictive and prescriptive analytics
- Real-time decision-making
- Integration of big data technologies for large-scale data processing

Comparative Analysis

- Web 1.0: Static, no interaction, minimal data
- Web 2.0: Interactive, user-generated content, large-scale data
- Web 3.0: Intelligent, personalized, data-driven automation

Conclusion

The evolution from Web 1.0 to Web 3.0 has significantly transformed communication from passive consumption to intelligent interaction. It has also led to the growth of data analytics, enabling organizations to derive meaningful insights and make informed decisions. Social media today is not just a communication tool but a powerful analytical platform.

Q2. Discuss the architecture and components of social media systems with suitable real-world examples.

(AKTU End Semester Exam 2021, GATE IT – Distributed Systems & Network Models Concept)

Introduction

Social media systems are complex platforms designed to support communication, content sharing, and interaction among millions of users. These systems are built using scalable architectures and consist of several key components that enable efficient functioning.

Architecture of Social Media Systems

Modern social media platforms follow a distributed and scalable architecture to handle large volumes of data and users.

1. Client-Server Architecture

- Users interact through web browsers or mobile applications
- Requests are sent to servers for processing
- Servers respond with relevant content

2. Distributed Systems

- Data is stored across multiple servers
- Ensures scalability and fault tolerance
- Used by platforms like Facebook and Twitter

3. Microservices Architecture

- Application is divided into small independent services
- Each service performs a specific function such as authentication, messaging, or recommendation
- Improves flexibility and maintainability

4. Cloud-Based Infrastructure

- Uses cloud services for storage and computation
- Enables dynamic resource allocation
- Examples include AWS, Google Cloud

Core Components of Social Media Systems

1. Users (Nodes)

- Represent individuals or organizations
- Each user has a profile containing personal information
- Modeled as nodes in a network graph

2. Content

- Includes text posts, images, videos, and comments
- Generated and shared by users
- Forms the primary data in social media

3. Connections (Edges)

- Represent relationships such as friends, followers, or subscribers
- Can be directed (Twitter) or undirected (Facebook)

4. Interactions

- Includes likes, shares, comments, and reactions
- Indicates user engagement
- Used for analytics and recommendation systems

5. Communities and Groups

- Users form groups based on common interests
- Helps in targeted communication and marketing

Real-World Examples

Facebook

- Uses graph databases to manage user relationships
- Implements news feed algorithms for content ranking
- Handles billions of interactions daily

Twitter (X)

- Uses real-time streaming architecture
- Processes tweets instantly
- Focuses on directed graphs (followers)

Instagram

- Focuses on media sharing
- Uses AI-based recommendation systems
- Emphasizes engagement metrics

Role in Social Media Analytics

- Graph structure helps in network analysis
- Interaction data is used for sentiment analysis
- User behavior is analyzed for targeted advertising
- Communities help identify trends and influencers

Conclusion

The architecture and components of social media systems are designed to support scalability, efficiency, and real-time interaction. Understanding these elements is crucial for analyzing social networks and extracting valuable insights through analytics.

Q3. Explain different types of social media platforms and analyze their characteristics with examples.

(AKTU End Semester Exam 2023, Similar concepts in GATE – Internet & Communication Systems)

Introduction

Social media platforms are diverse in nature and serve different purposes based on user needs and content types. Understanding their classification is essential for social media analytics as each platform generates different types of data and user behavior patterns.

Classification of Social Media Platforms

1. Social Networking Platforms

- These platforms focus on building personal and professional relationships
- Users create profiles and connect with others

- Examples: Facebook, LinkedIn
- Features include messaging, profile sharing, and networking

Characteristics

- Strong network structure
- High interaction among users
- Useful for relationship analysis and community detection

2. Microblogging Platforms

- Allow users to share short messages or updates
- Content is concise and real-time
- Example: Twitter (X)

Characteristics

- Fast information dissemination
- Hashtag-based categorization
- Useful for trend analysis and sentiment mining

3. Media Sharing Platforms

- Focus on sharing images and videos
- Examples: Instagram, YouTube

Characteristics

- High visual content
- Engagement through likes, comments, and shares
- Useful for image/video analytics and influencer analysis

4. Discussion Forums and Q&A Platforms

- Enable users to ask questions and share knowledge
- Examples: Reddit, Quora

Characteristics

- Topic-based communities
- Long-form discussions
- Useful for opinion mining and knowledge extraction

5. Messaging Platforms

- Provide private communication between users
- Examples: WhatsApp, Telegram

Characteristics

- Encrypted communication
- Limited public data availability
- Useful for studying communication patterns

Comparison of Platforms

- Social networking focuses on relationships
- Microblogging focuses on real-time updates
- Media sharing emphasizes visual content
- Forums focus on discussions
- Messaging focuses on private communication

Role in Social Media Analytics

- Different platforms generate different data types (text, image, video)
- Helps in selecting appropriate analytical techniques
- Enables targeted marketing strategies
- Provides insights into user behavior and preferences

Conclusion

Different types of social media platforms serve distinct purposes and generate diverse datasets. Understanding their characteristics is essential for effective social media analytics and decision-making.

Q4. Describe the components of social media and explain their role in data generation and analytics.

(AKTU End Semester Exam 2020, GATE – Data Models & Networks Concept)

Introduction

Social media is composed of several fundamental components that interact to create a dynamic ecosystem. These components are responsible for generating vast amounts of data, which is analyzed to extract meaningful insights.

Core Components of Social Media

1. Users (Nodes)

- Represent individuals or organizations
- Each user has a profile with attributes such as name, age, interests
- Modeled as nodes in graph theory

Role in Analytics

- Used to identify influential users
- Helps in centrality analysis and user segmentation

2. Content

- Includes posts, images, videos, and comments
- Generated continuously by users

Role in Analytics

- Used for sentiment analysis
- Helps in topic modeling and trend detection

3. Connections (Edges)

- Represent relationships between users
- Can be directed or undirected

Role in Analytics

- Helps in network analysis
- Used for community detection

4. Interactions

- Includes likes, shares, comments, and reactions
- Indicates user engagement

Role in Analytics

- Helps measure popularity and engagement
- Used in recommendation systems

5. Communities and Groups

- Users form groups based on common interests

Role in Analytics

- Helps identify clusters in networks
- Used for targeted marketing

Data Generation Process

- Users create content and interact with others
- Each action generates data
- Data is stored and processed for analysis

Importance in Social Media Analytics

- Provides structured and unstructured data
- Enables predictive analysis
- Helps in business decision-making

Conclusion

The components of social media play a crucial role in data generation and analysis. Understanding these elements helps in effectively applying analytical techniques to extract insights.

Q5. Explain the role of social media in society and discuss its positive and negative impacts.

(AKTU End Semester Exam 2021, General Studies + GATE awareness topics)

Introduction

Social media has become an integral part of modern society, influencing communication, education, politics, and culture. Its widespread usage has both positive and negative consequences.

Role of Social Media in Society

1. Communication

- Enables instant communication across the globe
- Connects people regardless of geographical boundaries

2. Education and Knowledge Sharing

- Provides access to information and online learning
- Platforms like YouTube offer educational content

3. Social Awareness

- Spreads awareness about social issues
- Supports social movements and campaigns

4. Political Influence

- Used for political campaigns and public opinion formation
- Helps in citizen engagement

Positive Impacts

1. Connectivity

- Strengthens relationships
- Enables global networking

2. Information Dissemination

- Quick sharing of news and updates
- Real-time communication

3. Business Opportunities

- Supports digital marketing
- Helps small businesses reach global audiences

Negative Impacts

1. Misinformation

- Spread of fake news
- Misleading information

2. Privacy Issues

- Data leakage and misuse
- Unauthorized data access

3. Addiction

- Excessive usage affects mental health
- Reduces productivity

4. Cyberbullying

- Online harassment and abuse

Conclusion

Social media plays a dual role in society, offering numerous benefits while also posing significant challenges. Proper regulation and awareness are necessary to maximize its advantages.

Q6. Discuss the role of social media in business and explain how analytics helps in decision making.

(AKTU End Semester Exam 2022, GATE – Data Analytics Applications)

Introduction

Social media has transformed the way businesses operate by providing platforms for marketing, customer interaction, and brand building. Analytics plays a crucial role in extracting insights from social media data.

Role of Social Media in Business

1. Marketing and Branding

- Businesses promote products through social media
- Helps in brand awareness

2. Customer Engagement

- Direct interaction with customers
- Feedback collection

3. Market Research

- Understanding customer preferences
- Identifying trends

4. Customer Support

- Resolving issues through social platforms

Role of Analytics in Business Decision Making

1. Sentiment Analysis

- Determines customer opinions
- Helps improve products

2. Trend Analysis

- Identifies popular topics
- Helps in strategic planning

3. Targeted Advertising

- Uses user data for personalized ads

4. Performance Measurement

- Analyzes campaign effectiveness

Benefits of Social Media Analytics

- Data-driven decisions
- Improved customer satisfaction
- Increased ROI

Conclusion

Social media and analytics together provide powerful tools for businesses to understand customers and make informed decisions. Their integration is essential for success in the digital age.

Q7. Explain cookies in social media analytics and discuss how they track user behavior.

(AKTU End Semester Exam 2023, GATE – Web Technologies Concept)

Introduction

Cookies are small text files stored on a user's device by web browsers when visiting websites. In social media analytics, cookies play a crucial role in tracking user behavior, preferences, and interactions across platforms. They enable personalized experiences and targeted advertising.

What are Cookies

- Small data files stored in the browser
- Contain user-specific information such as session ID, preferences
- Created by websites during user visits

Types of Cookies

1. Session Cookies

- Temporary cookies
- Deleted after the browser is closed
- Used for session management

2. Persistent Cookies

- Stored for a longer duration
- Track user behavior over time

3. First-Party Cookies

- Created by the website visited
- Used for improving user experience

4. Third-Party Cookies

- Created by external domains
- Used for advertising and tracking

Working of Cookies in Social Media

- When a user visits a platform, a cookie is stored
- The cookie records user actions such as clicks, searches, and time spent
- Data is sent back to servers for analysis
- Helps identify returning users

Role in Tracking User Behavior

- Tracks browsing history
- Monitors user preferences
- Records interactions such as likes and shares
- Helps in building user profiles

Applications in Social Media Analytics

- Personalized content recommendations
- Targeted advertising
- Behavioral analysis
- Conversion tracking

Advantages

- Improves user experience
- Enables accurate data collection
- Supports marketing strategies

Limitations and Issues

- Privacy concerns
- Data misuse
- Dependence on user consent

Conclusion

Cookies are essential tools in social media analytics for tracking user behavior and enhancing personalization. However, their use must be balanced with privacy considerations.

Q8. Discuss web analytics tools such as Google Analytics and Meta Pixel and explain their role in social media analytics.

(AKTU End Semester Exam 2022, GATE – Data Analytics Tools Concept)

Introduction

Web analytics tools are used to collect, measure, and analyze user interactions on websites and social media platforms. They provide insights into user behavior, traffic sources, and campaign performance.

Google Analytics

Features

- Tracks website traffic
- Provides user demographics
- Measures session duration and bounce rate

Working

- Uses tracking code embedded in websites
- Collects data about user visits
- Generates reports and dashboards

Applications

- Website performance analysis
- User behavior tracking
- Conversion tracking

Meta Pixel (Facebook Pixel)

Features

- Tracks user activity on websites
- Measures effectiveness of Facebook ads

Working

- Embedded as a code snippet
- Tracks actions such as purchases, clicks

Applications

- Ad performance measurement
- Retargeting campaigns
- Audience segmentation

Role in Social Media Analytics

- Tracks user journey across platforms
- Measures ROI of campaigns
- Provides data for decision making

Advantages

- Real-time data tracking
- Detailed insights
- Improves marketing strategies

Challenges

- Data privacy issues
- Requires technical implementation
- Dependence on cookies

Conclusion

Web analytics tools like Google Analytics and Meta Pixel are essential for understanding user behavior and improving marketing effectiveness in social media.

Q9. Differentiate between standard cookies and zombie cookies and analyze their impact on privacy.

(AKTU End Semester Exam 2023, GATE – Security & Privacy Concept)

Introduction

Cookies are widely used for tracking user behavior, but different types of cookies have different characteristics and implications. Standard cookies and zombie cookies are two important types with distinct features.

Standard Cookies

- Stored in browser
- Can be deleted by users
- Used for session management and personalization

Zombie Cookies

- Recreated automatically after deletion
- Stored in multiple locations
- Difficult to remove

Comparison

Storage

- Standard: Browser storage
- Zombie: Multiple storage mechanisms

User Control

- Standard: Easy to delete
- Zombie: Hard to delete

Purpose

- Standard: Tracking and personalization
- Zombie: Persistent tracking

Impact on Privacy

Standard Cookies

- Moderate privacy concerns
- Users have control

Zombie Cookies

- High privacy risk
- Used for aggressive tracking

Ethical Issues

- Lack of user consent
- Violation of privacy rights

Conclusion

While standard cookies are widely accepted, zombie cookies raise serious privacy concerns and ethical issues in social media analytics.

Q10. Explain user-generated content and discuss its importance in social media analytics.

(AKTU End Semester Exam 2021, GATE – Data Analysis Concept)

Introduction

User-generated content (UGC) refers to any form of content created by users on social media platforms. It is a primary source of data in social media analytics.

Types of UGC

- Text posts
- Images and videos
- Reviews and comments
- Blogs and discussions

Characteristics

- Unstructured data
- High volume
- Real-time generation

Importance in Analytics

1. Sentiment Analysis

- Helps understand user opinions

2. Trend Detection

- Identifies popular topics

3. Customer Insights

- Provides feedback on products

4. Influencer Identification

- Detects key users

Challenges

- Noise in data
- Data quality issues
- Language diversity

Conclusion

UGC is a valuable resource for social media analytics, providing insights into user behavior and preferences.

Q11. Explain the concept of social media data and discuss its types and characteristics.

(AKTU End Semester Exam 2020, GATE – Big Data Concept)

Introduction

Social media data refers to the information generated by users through interactions on social platforms. It is a major component of big data.

Types of Social Media Data

1. Structured Data

- Organized in tables
- Example: user profiles

2. Unstructured Data

- Text, images, videos
- Difficult to analyze

3. Semi-Structured Data

- JSON, XML formats

Characteristics (5Vs)

- Volume: Large amount of data
- Velocity: High speed generation
- Variety: Different data types
- Veracity: Data uncertainty
- Value: Useful insights

Applications

- Marketing
- Recommendation systems
- Predictive analysis

Conclusion

Social media data is complex and diverse, requiring advanced techniques for analysis.

Q12. Discuss challenges and ethical issues in social media analytics.

(AKTU End Semester Exam 2022, GATE – Ethics in Computing)

Introduction

Social media analytics involves collecting and analyzing large amounts of user data, which raises several challenges and ethical concerns.

Technical Challenges

- Handling big data
- Data integration
- Real-time processing

Privacy Issues

- Unauthorized data collection
- Data breaches
- Lack of user consent

Ethical Issues

1. Data Misuse

- Using data without permission

2. Bias in Algorithms

- Discrimination in analysis

3. Transparency

- Lack of clarity in data usage

Legal Issues

- Compliance with data protection laws
- Regulations like GDPR

Solutions

- Data anonymization
- User consent mechanisms
- Ethical guidelines

Conclusion

While social media analytics offers valuable insights, it must be conducted responsibly, ensuring privacy and ethical standards.